Role of Cementitious Materials in Meeting Regulatory and Stakeholder Requirements for DOE LLW Disposal Workshop

DOE Workshop on Cementitious Materials for Waste Treatment, Disposal, Remediation and Decommissioning

December 12 - 14, 2006

Common Themes Throughout Presentations

- Desire to protect human health and the environment both in the short-term and long-term
- Diversity and complexity of decisions.
- Need for more realistic leach tests that consider actual management conditions, waste form, and range of potential field conditions
- Need for providing for contingencies in case there is a potential failure

Common Themes Throughout Presentations (Cont.)

- Importance of
  - Waste characterization (adequacy, defining representative sample size)
  - Validation of leach protocol being used
  - Working collaboratively with regulatory authorities, the public, and other stakeholders

Common Themes Throughout Presentations (Cont.)

- Importance of
  - Seeking peer review by independent experts on analysis and proposed plans
  - Finding practical solutions that consider logistics, resources, and uncertainties.
  - Considering impacts from secondary wastes which may have more environmental impact than primary waste streams being managed.

Summary of DOE & Contractor Key Points

- Cementitious materials are presently being utilized as a treatment & disposal option in the waste management and decontaminating & decommissioning (D&D) of facilities
- Sites have a large number of D&D activities (HLW, Tank Closures) that will have a need for a cementitious form for next ~ 30/40 yrs
- Provides a relatively stable waste form at a relatively low cost
- Issues with dealing with ancillary equipment and pipes (how to characterize and how to manage)

Summary of DOE & Contractor Key Points (Cont)

- Need for further research on how waste form performs –
  - Structural stability over long-term performance
  - Mobility of radionuclides within the matrix
  - Standardization of waste performance in mixes with other materials (Flowability, cracking, water infiltration, waste encapsulation. durability)
- Priority for research
  - Low hydaulic conductivy
  - Degradation resistance
  - Pore water chemistry (high pH, low EH)
  - Strength
  - Flowability
- Need to improve technical basis for more sound management decisions through improved waste characterization, modeling, and establishing long-term performance

Summary of Regulatory & Stakeholder Perspectives

- Public is concerned with treatment and disposal of cementitious waste; want involvement in management decisions
- Want accurate predictions of waste form over time
- Want contingency plan in case safe guards fail
- Support use of cementitous materials as appropriate
- Concern with cracking and infiltration resulting in mobility of constituents of concern
- Don’t recommend use of cementitous materials as cap
- Need for more information on long and short-term performance on cracking, infiltration, flowability, mixing with other wastes
- Need more realistic leach protocols to ensure more accurate predictions

Summary of Regulatory & Stakeholder Perspectives - Leach Testing Protocols

- Wide range of leach tests in use. TCLP used very broadly even when not required or relevant.
- Leach tests tailored to the conditions that the material will be managed will better identify waste leaching potential.
- EPA has adopted the leach protocol described in (Kosson et al., 2002) for evaluating potential leaching of metals from coal combustion residues resulting from changes to air pollution control at coal-fired electric utilities.
- EPA has effort underway to develop Leach Testing Framework into official method for use in beneficial use and delisting determinations, and waste disposal decisions where TCLP is not required or applicable.
- Future grout formulations will need to take into account potential changes to coal combustion residues (fly ash and flue-gas desulfurizataion gypsum)

NRC Perspectives

- Supportive of use of cementitious waste forms but have identified a number of uncertainties that need further investigation such
  - Hydraulic properties over times
  - Unsaturated properties
  - Retention properties
  - Degradation mechanisms of novel formulations and long-term performance
  - Synergism between empirical data and degradation modeling.
  - Influence of fractures on degradation mechanisms.
  - Oxidation of reducing formulations over time.
  - Extrapolation of lab data to field performance over thousands of years.
  - National and international community should share data and lessons learned.